and second regions **520** and **530**, wherein the region first **520** is coupled to the channel **510**. For a P-type transistor, the source terminal **502** and drain terminal **504** can be p-type doped, the first region **520** can be intrinsic or lightly doped, such as with n-type dopant, and the second region **530** can be doped with n-type dopant such that the second region **530** can have higher doping concentration than the first region **520**. Similarly, for an N-type transistor, the source terminal **502** and drain terminal **504** can be n-type doped, the first region **520** can be intrinsic or lightly doped with p-type dopant, and the second region **530** can be doped with p-type dopant such that the second region **530** can have higher doping concentration than the first region **520**.

[0037] The length of the diode **52***a* can be 0.5 um to 10 um, and can be 1 um to 6 um in some embodiments. The length of the intrinsic or lightly doped region **520**, "d", can be larger than 0 um but smaller than 5 um. On the other hand, the distance "D" between the edge E**1** of the gate terminal **500** and the edge E**2** of the diode **52***a* is larger than 0 um but smaller than (L-W) um, where L is the width of the gate terminal **500** and W is the width of the diode (the fourth terminal) **52***a* respectively.

[0038] Although the fourth-terminal has two regions **520** and **530** in the embodiment, it is possible to include three regions in the fourth-terminal. Refer to FIG. **5**B, which is a top view shown structure of a driving transistor and a fourth terminal used in the pixel driving circuit according to one embodiment of the present invention. The fourth terminal (diode) **52***b* includes first, second, and third regions **520***b*, **525** and **530**. In order to maintain normal operation, the first region **520***b* can be intrinsic or lightly-doped. The second region **525** can be lightly-doped. The third region **530** can be heavily-doped so that the third region **530** has higher doping concentration than the second region **525**. When the first region **520***b* and the second region **525** are lightly-doped, the second region **525** can have higher doping concentration than the first region **520***b*. The driving transistor **50***b* can be P-type or N-type.

[0039] Refer back to FIG. **5**A, the diode **52***a* including regions **520** and **530** has two main functions. One is to enhance the degree of kink effect suppression. The other is to ensure the driving TFT device work correctly. When i (stands for intrinsic)-n^+ (stands for highly doped with n-type dopant) diode is adopted in the device structure, the n^+ layer (region **530**) is used to reduce the conducting resistance for the electrons resulted from impact ionization. Therefore, the extra electrons can flow outward the TFT device quickly, which makes the kink effect be more unobvious. On the other hand, holes will accumulate at the channel region **510** when the device turns on. If no i or n^- region **520** is inserted between the p^+ (channel **510**) and n^+ (region **530**) layers, this p^+-n^+ diode will conduct directly when the TFT device is at on state. The transistor behavior disappears for the driving TFT. In the embodiments of the present invention, in order to maintain the driving TFT work correctly, the i or n^- region **520** is disposed.

[0040] In the embodiment, the diode **440** shown in FIG. **4**A is formed by the regions **520** and **530** shown in FIG. **5**A. However, the diode **440** can be a diode separated from the driving transistor.

[0041] Layout of the circuitry of FIG. **4**A is shown in FIG. **6**. Please refer to FIG. **6**, signals on the scan line **600** and data line **602** is used to control the switching transistor T**1** for controlling the voltage applied to the gate of the driving transistor T**2** and the capacitor C. Source terminal **614** of the driving transistor T**2** and the fourth terminal **630** are coupled to the power line **604**. The fourth terminal (diode) **630** includes first and regions **631** and **632**. The first region **631** can be intrinsic or lightly-doped, and the second region **632** can be doped with higher doping concentration than the first region **631**. The first region **631** is coupled between channel (not shown) and the second region **632**, and the drain terminal **612** is coupled to a pixel electrode **650** (such as ITO).

[0042] The concept provided by the present invention can be applied to many other OLED driving circuits. Refer to FIG. **4**B, which is a circuitry diagram showing a pixel driving circuit according to one embodiment of the present invention, an N-type TFT is used as the driving transistor **450**, and the diode **455** are therefore connected between the channel of the driving transistor **450** and the voltage PVEE.

[0043] Another example is shown in FIG. **4**C, which is a circuitry diagram showing a pixel driving circuit according to one embodiment of the present invention. In the embodiment, a first control circuit, comprising a switching transistor **462** and capacitor **464**, is used to determine the voltage level applied on the gate terminal of the driving transistor **460** in accordance to the signal SCAN**1** and DATA. However, the driving transistor **460** does not directly couple to the OLED **480**. On the contrary, driving transistor **460** couples to the second control circuit, comprising a P-type transistor **470**, and the second control circuit couples to the OLED **480**. It should be noted that, although the transistor **470** is turned ON/OFF according to the signal SCAN**2**, it does not adjust current flowing through the OLED **480**. In other words, the current flowing through the OLED **480** is adjusted by the voltage level applied on the driving transistor **460** while the transistor **470** functions as an ON/OFF switch only. Accordingly, transistor **460** is termed as "driving transistor" here.

[0044] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.

What is claimed is:

1. A pixel driving circuit for an organic light emitting display (OLED) apparatus, which is adapted to drive an OLED having a first terminal and a second terminal and the first terminal coupling to a first voltage source, the pixel driving circuit comprising:

- a first control circuit, generating a control signal to control an OLED current supplied to the OLED;
- a driving transistor, having a first drain/source terminal, a second drain/source terminal and a gate terminal, the gate terminal receives the control signal to control a channel between the first and second drain/source terminal for adjusting the OLED current flowing through the channel; and
- a diode, coupling between the channel and a second voltage source.

2. The pixel driving circuit for OLED display apparatus according to claim **1**, wherein the driving transistor directly couples to the second terminal of the OLED.

3. The pixel driving circuit for OLED display apparatus according to claim **1**, further comprising: